



The Safety Analysis Report of Ignalina NPP

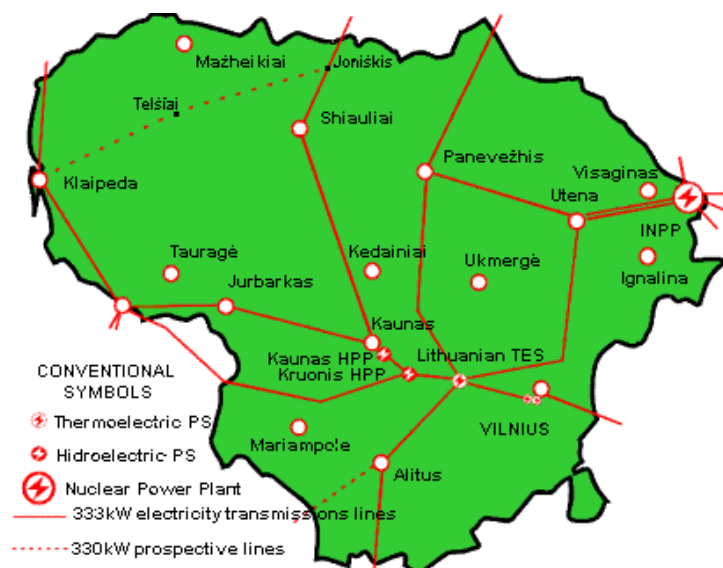
Prepared by A. Merežnikov, Engineering Support Department, Ignalina NPP

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Introduction

The Ignalina Nuclear Power Plant (INPP) consists of two units, commissioned in December 1983 and August 1987. Both units are Soviet designed RBMK-1500 reactors and differ from the RBMK-1000 plants operating in Russia and Ukraine, not only by a higher nominal power level, but also by several improved safety features, one of those being redesigned, more extensive Accident Localisation System (ALS).

The INPP is located in the north-eastern part of Lithuania on the southern bank of lake Drukshiai near the borders of Latvia and Byelorussia.



The Main Goals of INPP

INPP has issued a Mission Statement describing how the main goals will be reached:

- INPP has been established to produce electric power in most safe and efficient way;
- The markets of INPP are the Lithuanian consumers and export consumers;
- All personnel of INPP must work safely, reliably, efficiently and with high quality standard;
- INPP shall provide good working conditions and reward systems for the staff;
- INPP must have qualified personnel, reliable equipment, and good relations to suppliers, customers, the public and to owner.

The systematic evaluation of the safety at Ignalina NPP

Lithuania became independent in 1991. Necessary engineering support companies did not exist, and it was lack of money for adequate safety improvement. But the new safety improvement activities were initiated. Lithuania committed its responsibility for INPP safety. The Barselina Project (Probabilistic Safety Analysis, PSA Level 1) was initiated in the summer 1991.

Agreement with European Bank for Reconstruction and Development was signed in 1994. Many important projects were implemented, and the Western type Safety Assessment Report of INPP was included in the scope of this agreement. Countries of Western Europe, USA and IAEA assisted Lithuania to carry out a comprehensive INPP safety improvement program (SIP-1).

The Quality Assurance Program was initiated in 1995.

In 1995 SAR project was established to produce a Safety Analysis Report (SAR) for INPP which would assess the current level of safety through analysis and its review comparable to that commonly performed for Western nuclear power plants.

The PSA Level 1 was developed in 1996, taking into account plant changes, improved modeling methods and extended plant information concerning dependencies (area events, dynamic effects, electrical and signal dependencies).

The Safety Analysis Report was issued in 1997. Review of the SAR was performed and RSR report was issued. On basis of both documents the Ignalina Safety Panel prepared recommendations for Lithuanian Government. These documents were used as a basis for the new Ignalina Safety Improvement Program (SIP-2). Additionally some items were included from the SIP-1. SIP-2 was accepted in 1997 and shall be finished in 2005. Financial and engineering assistance from governments of Sweden, USA, UK, Finland and other countries is provided for implementation of this program.

The Quality Assurance Program was completed in 1999.

On 29 July 1999 VATESI issued a licence for operating Unit 1 at INPP for another five years.

SAR Project

The SAR Project team which prepared the report was headed by Vattenfall Nuclear AB and included staff from INPP, NIKIET (the chief designer of the reactor), Atomic Energy of Canada Ltd. and Stone & Webster Engineering.

SAR has examined three areas that are equally important to the safe operation of a nuclear power plant: Systems Analysis, Accident Analyses and Operational Safety Management.

The special Guidelines were prepared and approved before the start of the project. The assessments were based on the actual state of the plant including all modifications incorporated prior to July 1996.

The work was divided into 10 Task Groups:

- *Description and Verification of Current Plant State;*
- *History of Safety Performance and Environmental Impact;*
- *Fault Schedule;*
- *Systems Analysis;*
- *Accident Analysis;*
- *Equipment Qualification;*
- *Management of Ageing;*
- *Review of the Role of the Operator;*
- *Safety Management and Demonstration of Acceptability.*

The objective of the SAR was to base it upon standards which are demonstrably equivalent to accepted Western practices. Within the scope of this project it was not possible to review all Lithuanian/Russian regulations and make a cross comparison with accepted Western practice.

Therefore the task was limited to a review of the General Regulations for Nuclear Power Plant Safety OPB-88, the Nuclear Safety Regulations for Reactor Facility of NPP (PBYa RU AS-89), Regulations Governing the Installation and Operation of Localising Safety Systems in Nuclear Power Plants (PNAE-G-10-021-90) and Regulations for the Setting Up and Operation of Systems for Emergency Cooling and Heat Removal from a Nuclear Reactor to a Final Absorber (PNAE G-5-020-90). These documents were reviewed against accepted Western practice as exemplified in the Basic Principles for Nuclear Power Plants (Safety Series No. 75 INSAG 3), Code on the Safety of Nuclear Power Plants: Design (Safety Series No. 50-C-D), Code on the

Safety of Nuclear Power Plants: Operation (Safety Series No. 50-C-O) and several of the relevant Safety Guides when more details were required.

The standards review concluded that the Lithuanian/Russian regulations constitute an adequate framework to ensure that the Ignalina NPP Safety Analysis Report is produced in a manner consistent with Western practice. Additionally the following areas should be considered: Severe Core Damage Frequency, Fire Retardant Materials, Equipment Qualification (EQ), Shared Safety Facilities in Multi-Reactor NPPs, Dynamic Loading, Dependent Failures, Two Shutdown Systems, Separation of Control and Protective Functions, Trip Parameters from Shared Sensors, Control Room Habitability, Credit for Operator Actions, Regulations, Operating Instructions, Modifications, Records and Reports, Quality Assurance, Redundancy, Diversity, Independence and Separation, ATWS Analysis, and Seismic Considerations.

The results from the 94 reports prepared by the various Task Groups were obtained. The Report was typed on approximately 6500 pages in 24 files. There is the computer version of Report in English and Russian, it occupies 550 Mb using *Adobe Acrobat* Software. *Adobe Acrobat* allows to view, to navigate and to print in Adobe Portable Document Format (PDF).

The SAR reports were independently reviewed by the RSR team consisting of representatives from Lithuania, Western European and Russian TSOs, and experts from the USA headed by RISKAUDIT. Their review, along with summaries from the SAR team were submitted to the INPP Safety Panel, a group of senior safety experts assembled by the Lithuanian Government in agreement with the EBRD. The final SAR, along with all of the other reports, was presented by INPP to the Lithuanian regulator VATESI for use in licensing of Unit 1.

The noted studies provide a verified base of knowledge which makes it possible to assess the present level of plant safety, compare this level with other reactor plants and plan improvements in plant hardware and operational procedures which enhance the level of safety. Note, that statements made concerning plant safety in this summary are based on the consensus reached by the international expert community. A significant conclusion stated in the SAR is that none of the analysed safety concerns require the immediate shutdown of the plant.

SAR-2000

Whilst preparing the Safety Analysis Report (SAR) and Review of Safety Analysis Report (RSR) safety in both units of INPP was examined. The measures proposed by the two documents and the Ignalina Safety Panel have to be implemented in Units 1 and 2.

Considering that the SAR was issued in 1997 and a lot has been upgraded since, the SAR and RSR for Unit 2 will have to be adjusted. The INPP specialists who will be assisted in some subjects by TSOs will prepare the SAR. The RSR will be done by VATESI.

The Ignalina NPP has already submitted a draft containing all work related with licensing. Jointly with specialists from INPP, the Ministry of Economy and Lithuanian Energy Institute VATESI (a regulator) has discussed the draft and licensing dates.

If we work hand in hand the licence for Unit 2 will be issued by the end of 2002.

Status of SAR for Ignalina NPP

The Safety Analysis Report for a Nuclear Power Plant is a key licensing document that describes, in summary form, the plant design, components and systems, and methods and results of safety analysis. SAR along with other documents provides sufficient information to allow the regulator to judge that design meets or will likely meet safety requirements and acceptance criteria established by regulator in the interest of the public and plant personnel safety, and the environment.

In Lithuania there is legal basis for elaboration of SAR and for updating of SAR.